Bismarck

Investing in our Water System
Planning for the Next 20 Years

Table of Contents

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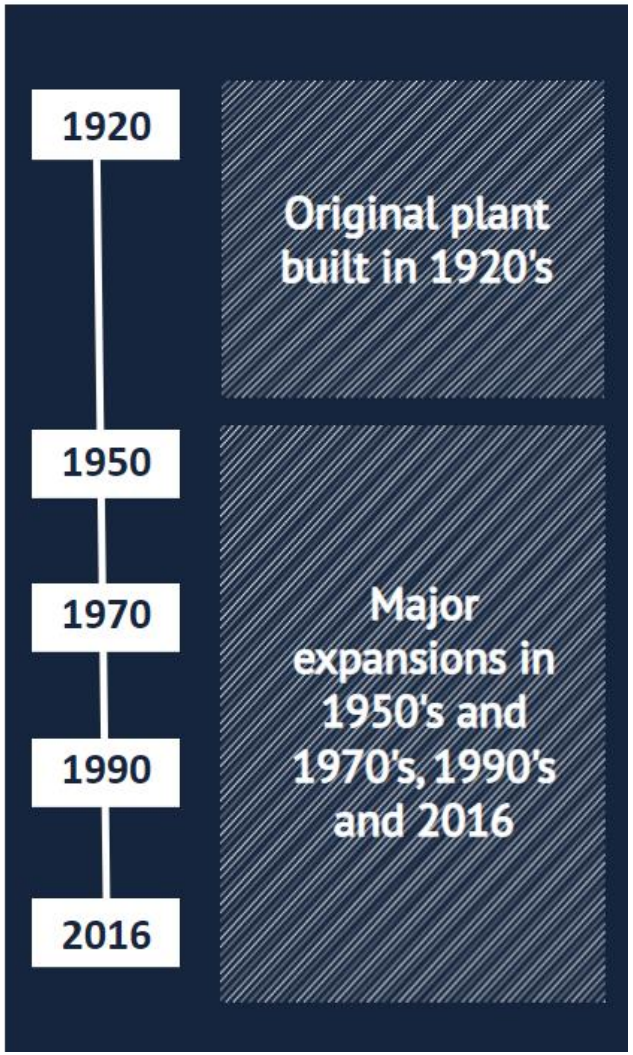
WATERWORKS

A History of Reliable Water Service



Over the past 100 years the City has maintained and updated the original plant to support growth and economic development in the region.

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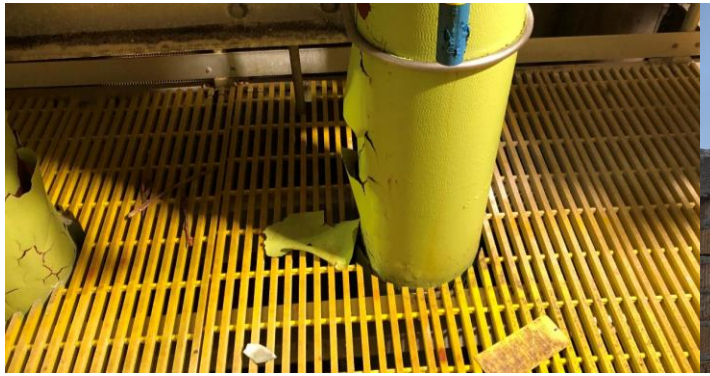
Master Plan Drivers

Reliability

Process equipment, structural, electrical, mechanical, health & safety, age and condition of facilities



Growth

Population growth and peak day water demands

Water Quality/Regulatory

Water hardness goals, Contaminants of emerging concern

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The Master Planning Process

Review plant condition

Identify rehab needs including immediate improvements

Evaluate processes to meet future capacity and water quality needs

Recommend schedule for improvements and plant expansion

Estimate costs

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Bismarck's Water Treatment Plant

- Treats up to 28 MGD of Missouri River Water through collector wells and surface water intake.
- Original plant built in 1920's
- Major expansion or refurbishment done in 1950's, 1970's, 1990's and 2010's.
- The last Master Plan was completed in 1998.

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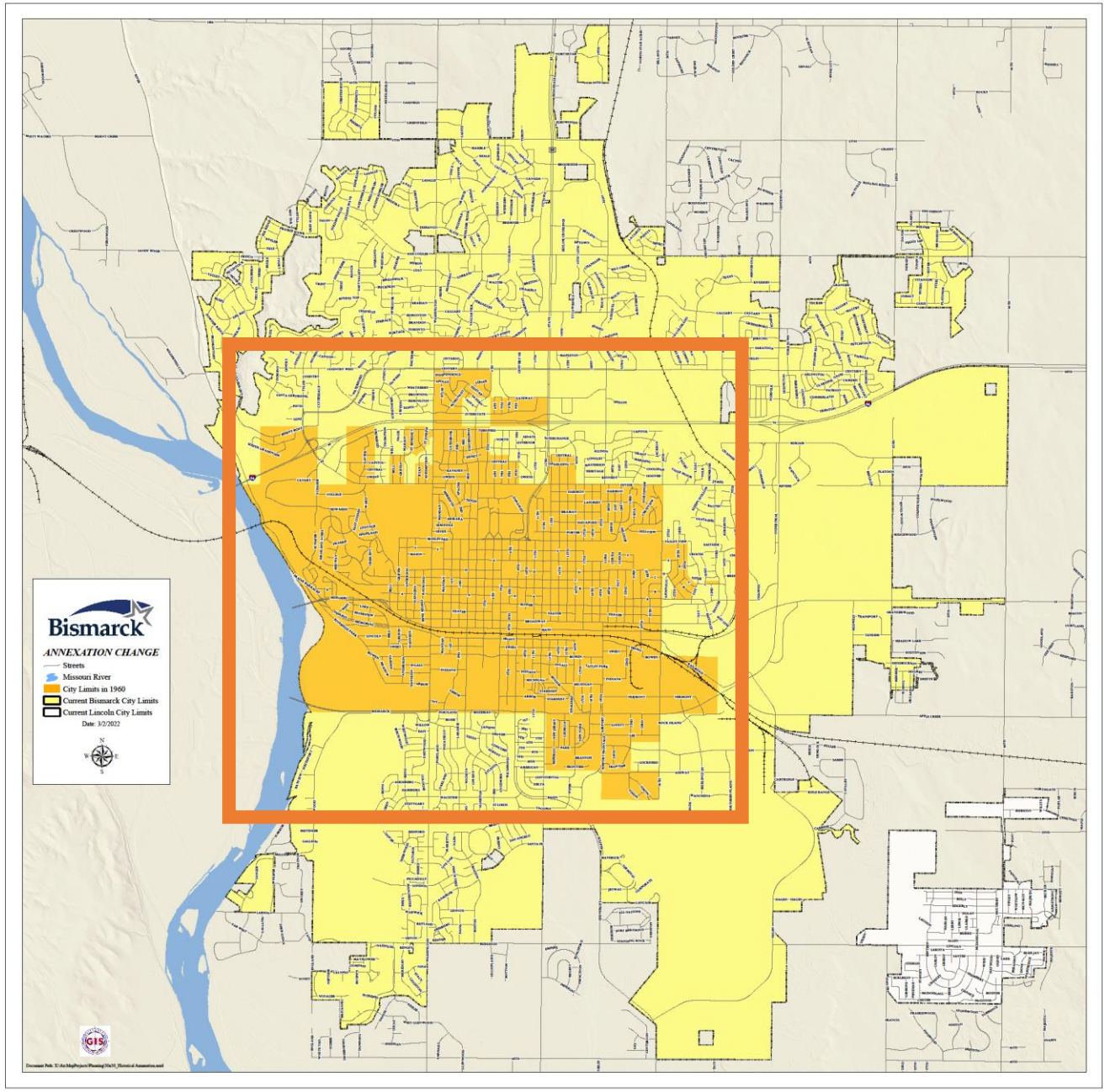
Estimated Population in 1965:
31,200



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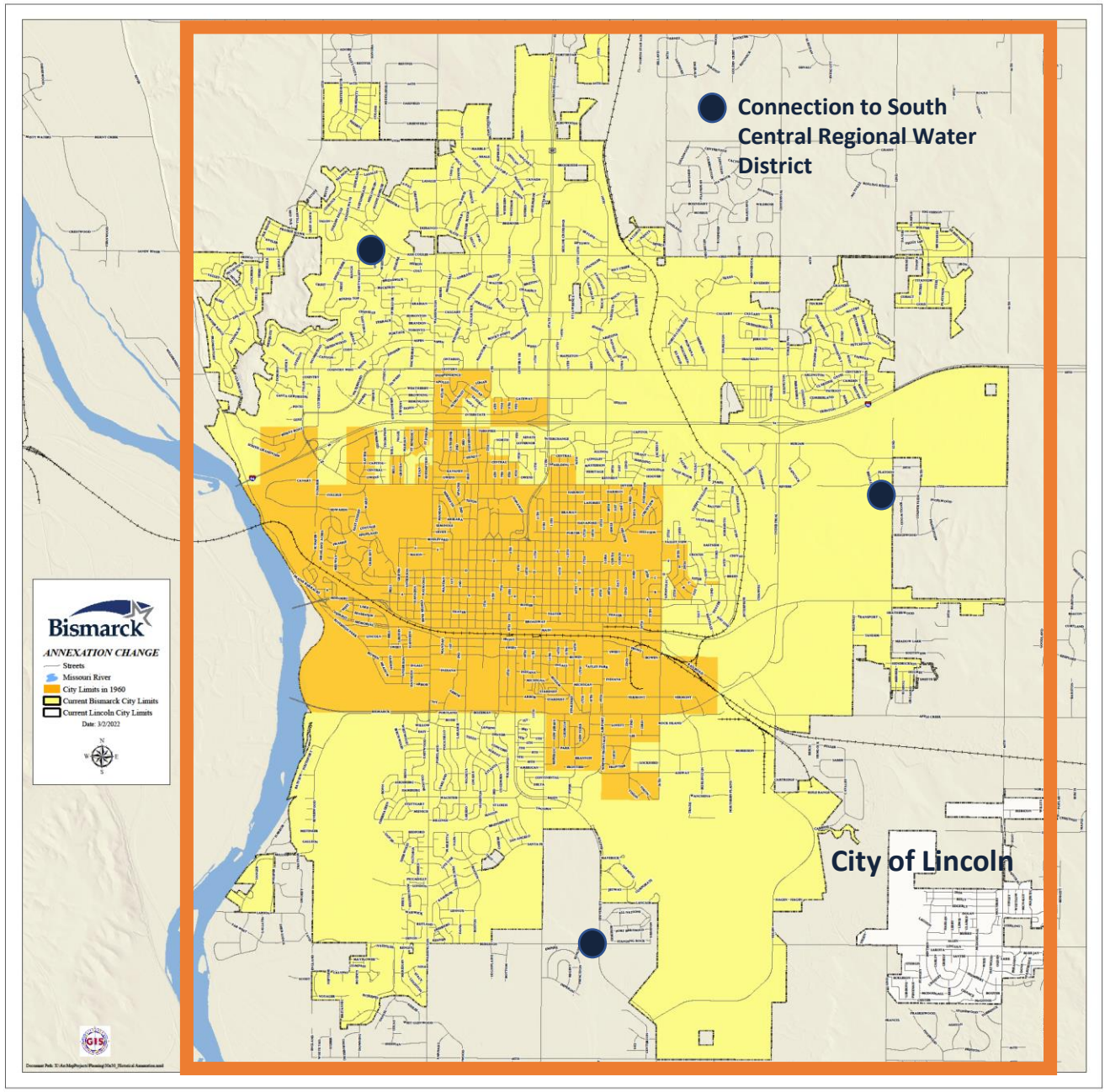
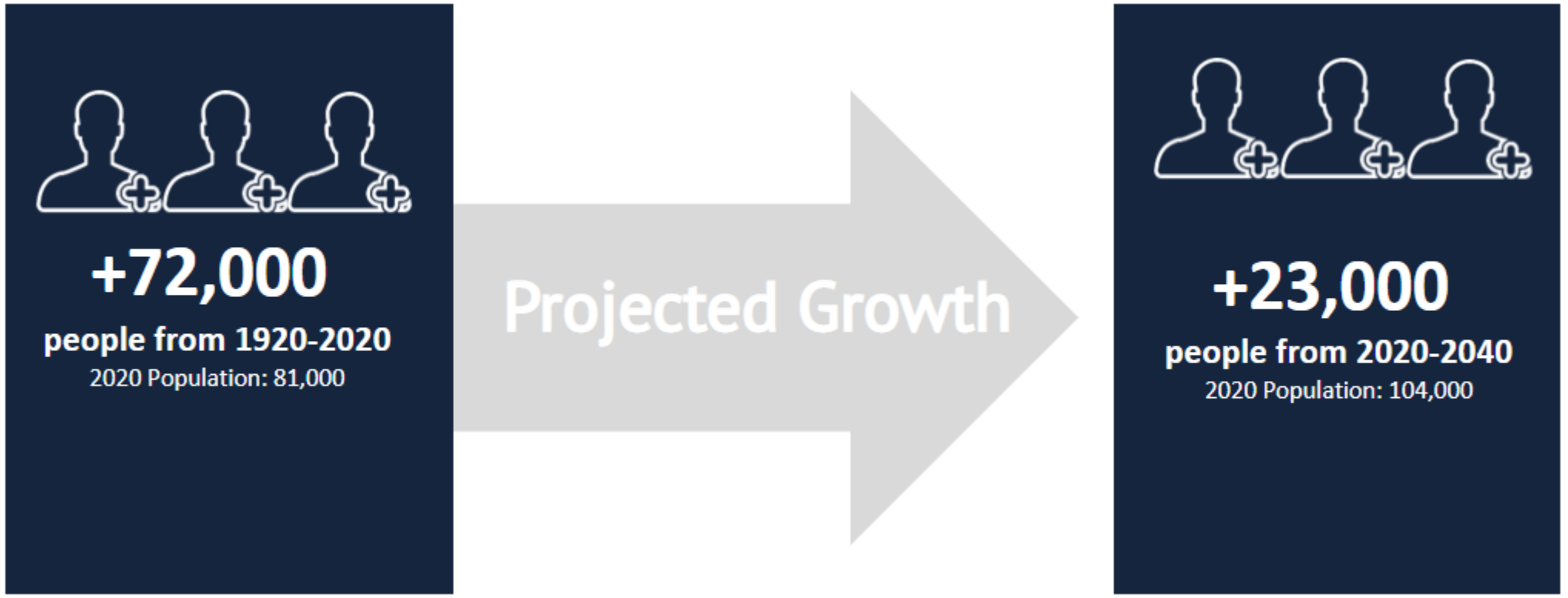
Estimated Population in 2020:
81,000



Bismarck Growth through 2040



* Does not include Lincoln or South Central Regional Water District service population

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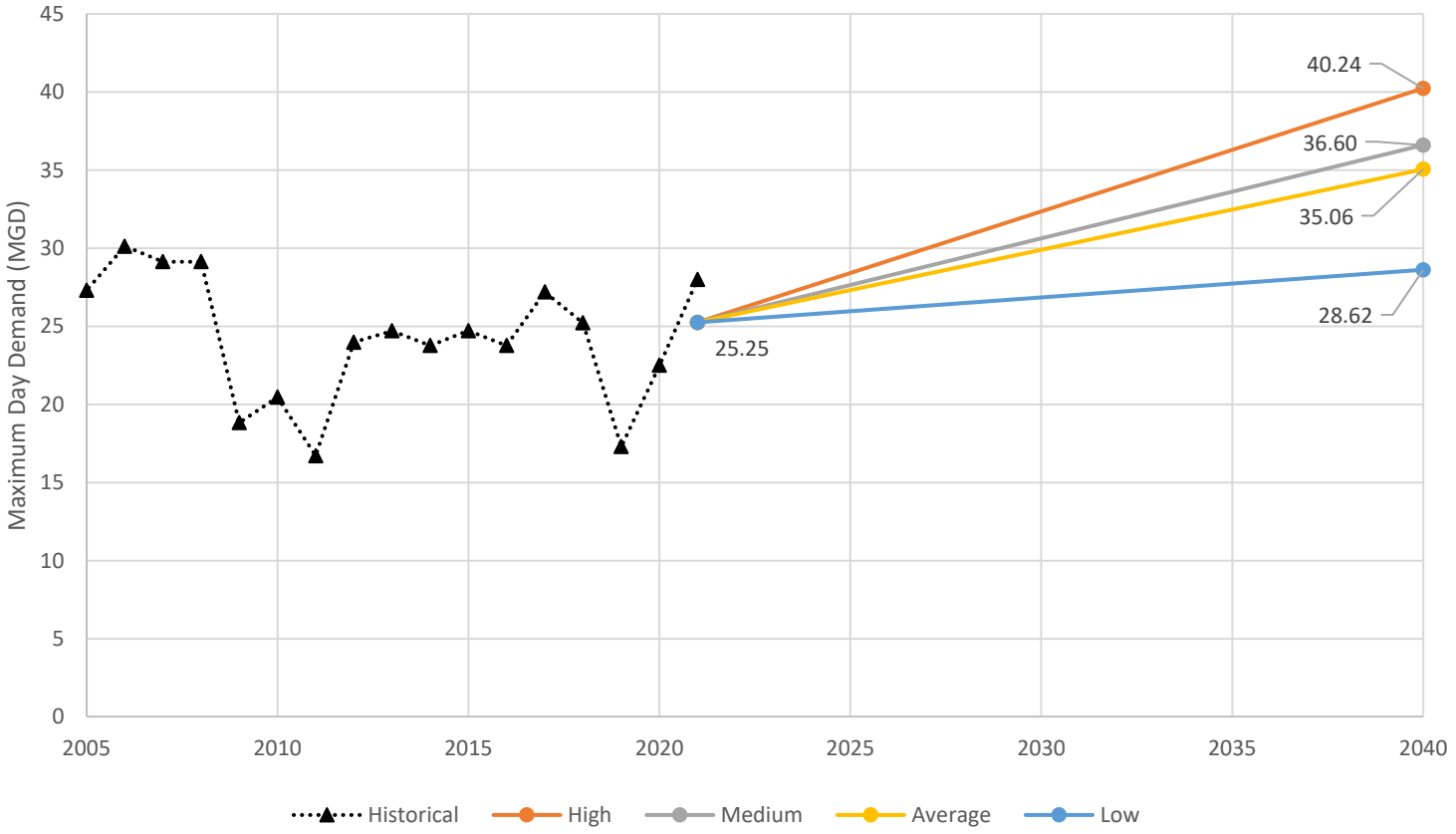
Water Use Predictions



- Water use is expected to increase with population growth
- Existing plant can treat up to 28 million gallons per day (MGD)
- Future design capacity of 40 MGD to meet peak day demands through 2040
- Timing for plant expansion will depend on monitoring of water use trends

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Water Treatment Plant Expansion

- Three alternative processes evaluated.

Alternative 1: Lime Softening & Media Filtration

Alternative 2: Ultrafiltration & Membrane Softening

Alternative 3: Lime Softening & Ultrafiltration

- All processes considered would meet projected demands and water quality goals.

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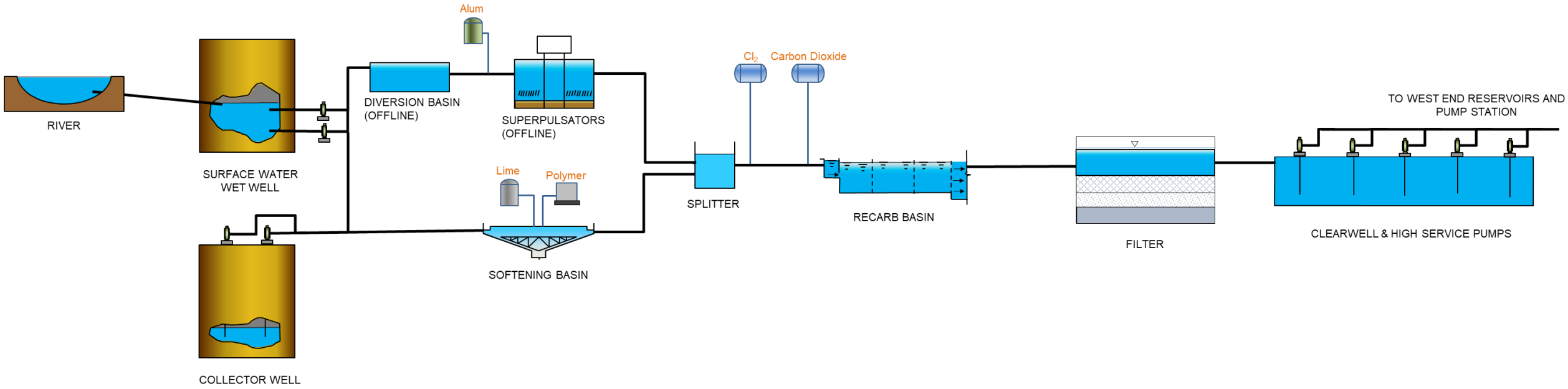
Current Water Treatment Process



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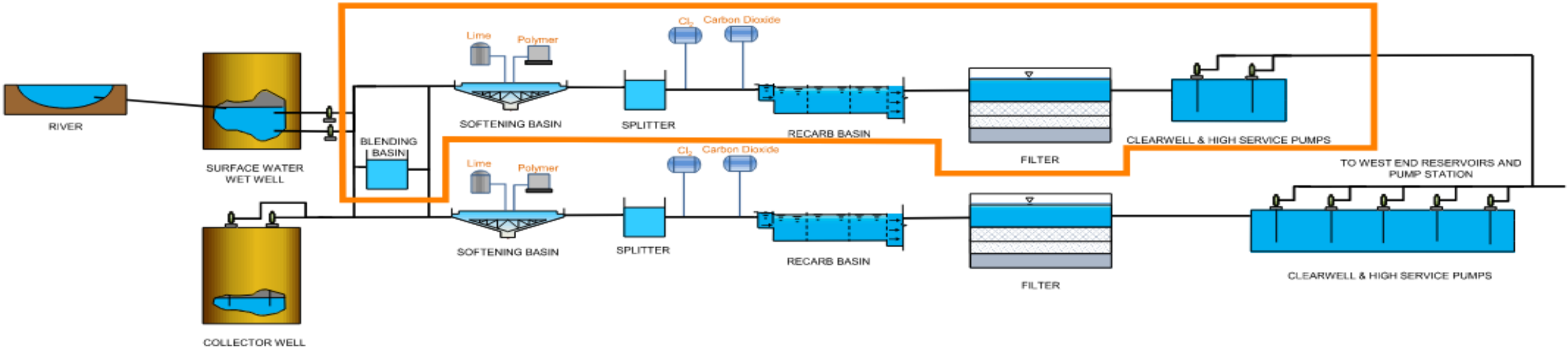
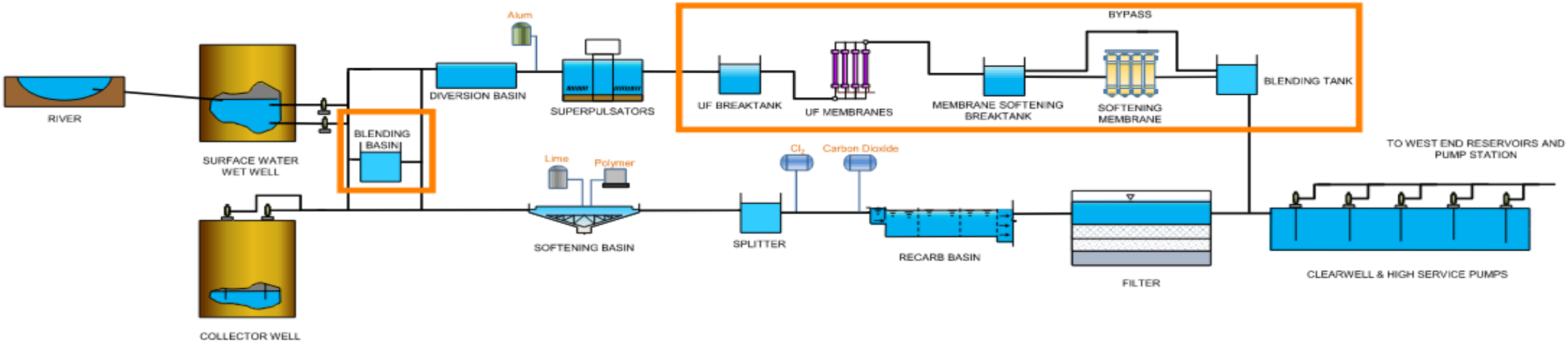
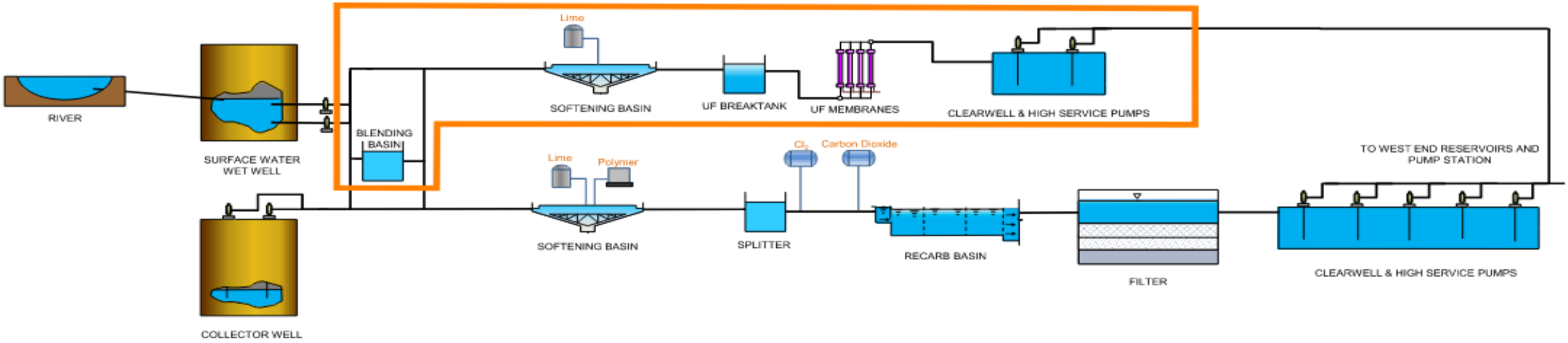
Alternative 1 – Lime Softening and Media Filtration



Alternative 2 – Ultrafiltration and Membrane Softening



Alternative 3 – Lime Softening and Ultrafiltration



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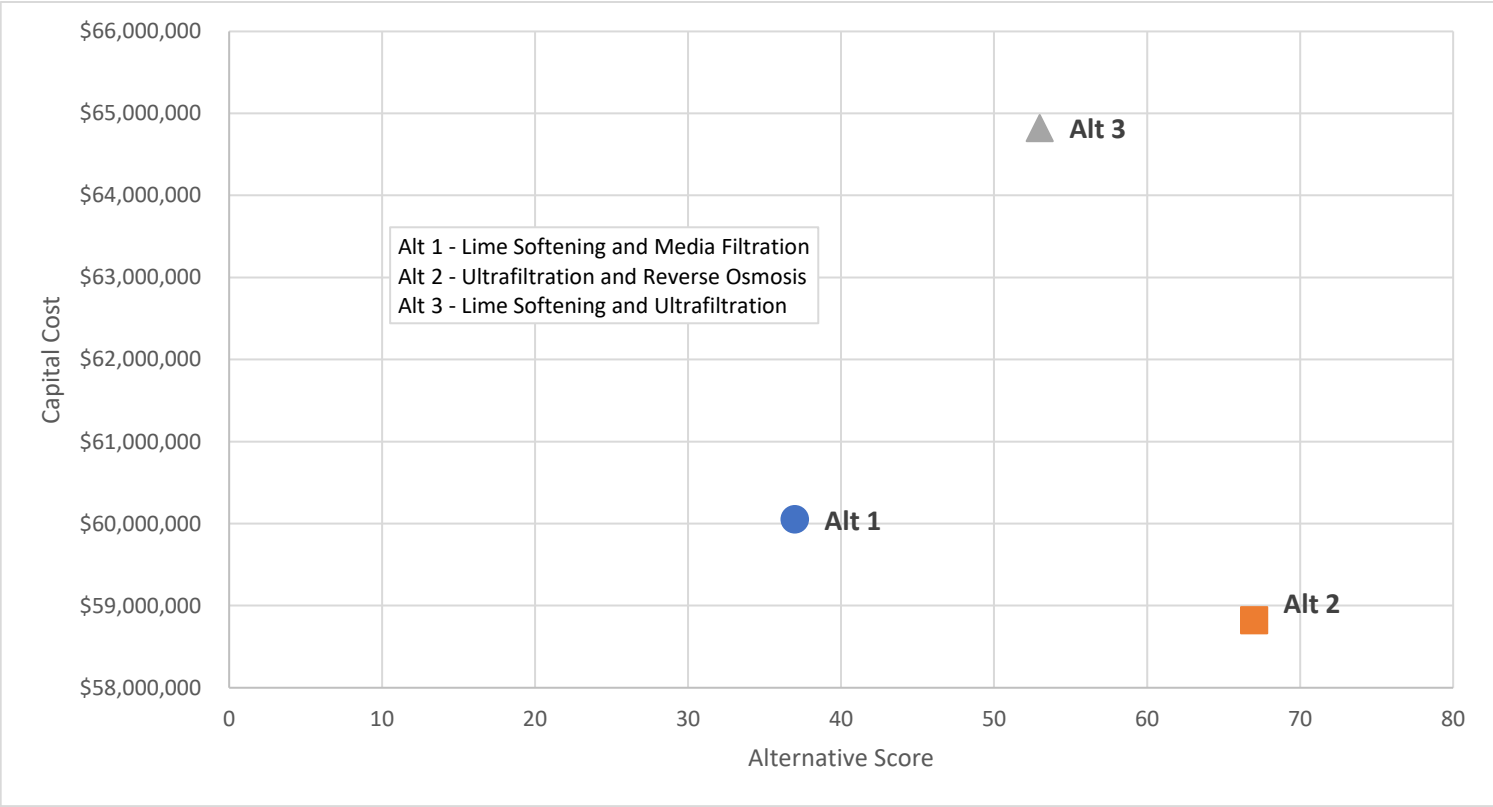
Capital Costs Evaluation



Comparing Capital Cost with Non-Monetary Score

- Monetary evaluation included capital cost and total of operation and maintenance costs over 20 years.
- Non-monetary evaluation conducted by staff to assess **operational flexibility, availability of chemicals, makes use of existing facilities**, etc.

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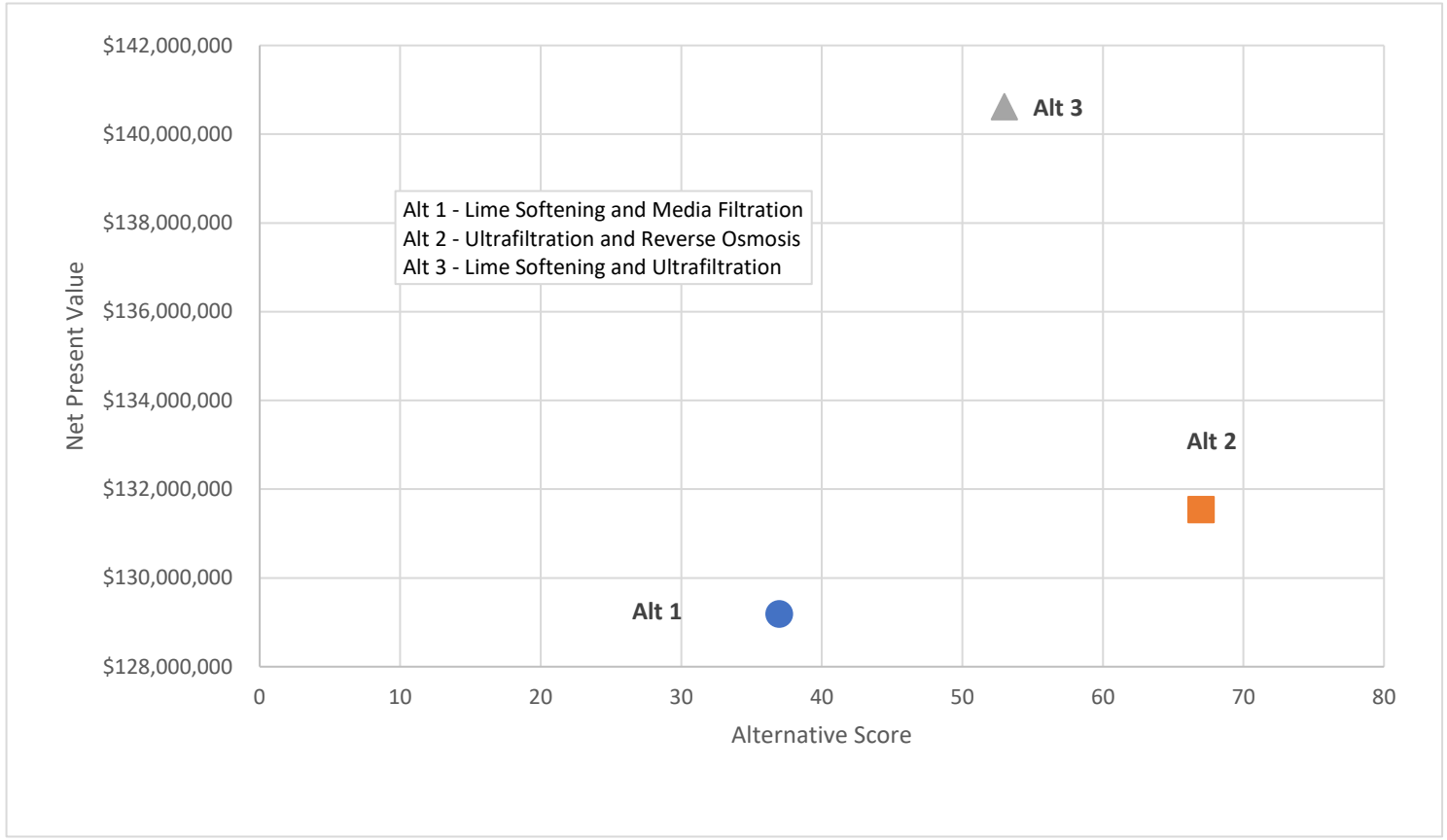
Life Cycle Evaluation



Comparing 20-year Net Present Value with Non-Monetary Score

- Monetary evaluation included capital cost and total of operation and maintenance costs over 20 years.
- Non-monetary evaluation conducted by staff to assess **operational flexibility, availability of chemicals, makes use of existing facilities**, etc.

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Best Alternative – Alternative 2

Item	Cost
Construction Cost	$63,000,000
Annual O&M Costs	$4,700,000
20-Year NPV O&M (2.5%)	$73,000,000
Total NPV (Total Capital + NPV O&M)	**$136,000,000**

Ultrafiltration & Membrane Softening is the best-value alternative

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Condition Assessment and Recommendations

- Nearly $17 Million in rehabilitation and replacement projects recommended in next 8 to 10 years
- Improvements will improve reliability of the existing processes and maintain existing facilities in good condition.
- Improvement types: Piping upgrades, SCADA upgrades, replace chemical feed equipment, pump motors and VFDs, other structural, architectural, mechanical, electrical improvements

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VFD Pump Considerations & Other Fix Now Items

- Existing high service pumps are soft starts with one VFD
- Concern with condition/age and reliability
- Address immediately
- Begin improvements to other critical assets

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Hydraulic Assessment and Recommendations

- Hydraulics of the existing plant were assessed
- Capacity is limited to 28 MGD because of hydraulic constrictions
- Recommended improvements include upsizing filter piping and re-coating the influent channel to reduce friction
- Short-term investment can increase capacity to approximately 31 MGD

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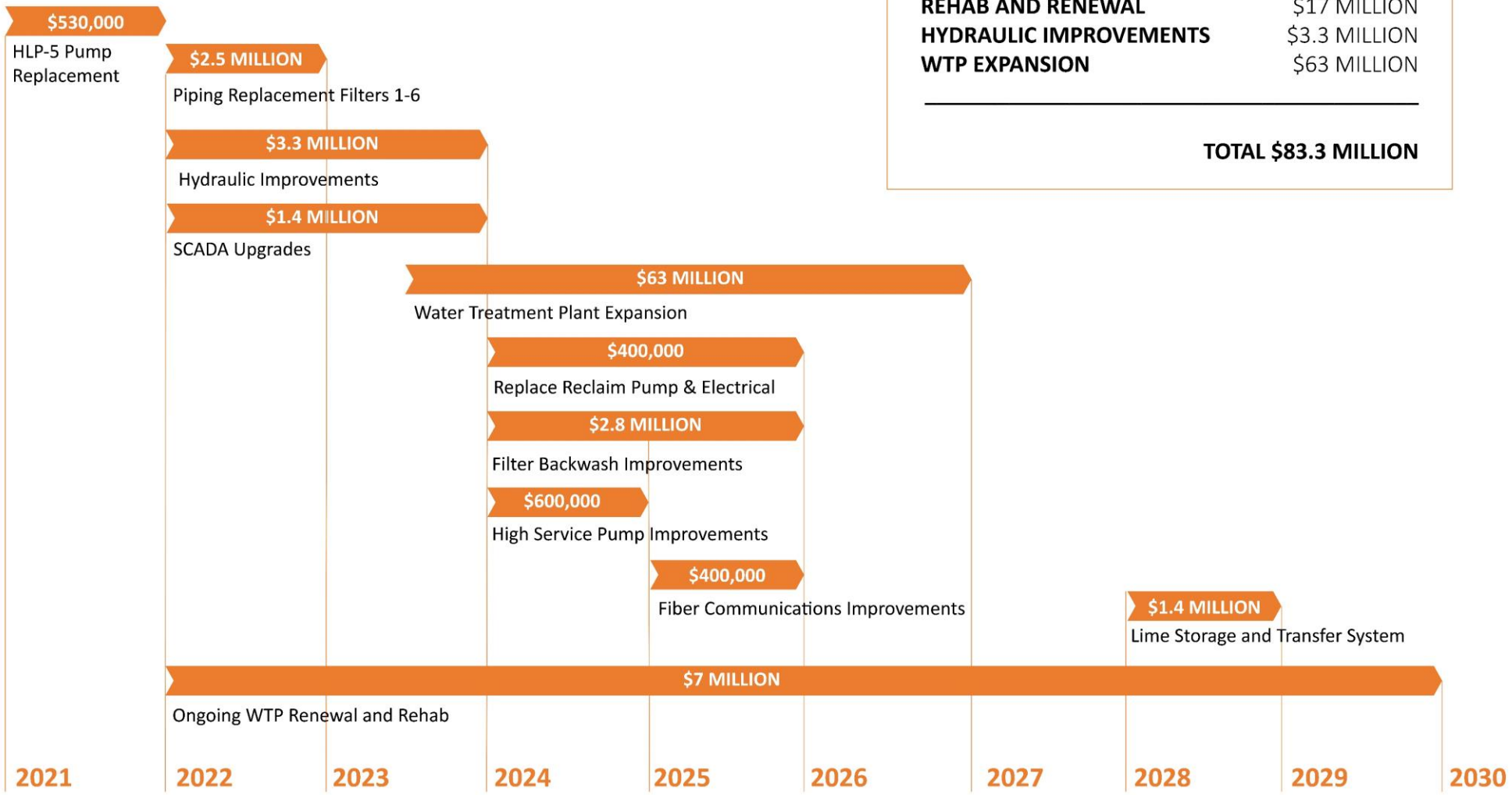
Next Steps



COST SUMMARY	
REHAB AND RENEWAL	$17 MILLION
HYDRAULIC IMPROVEMENTS	$3.3 MILLION
WTP EXPANSION	$63 MILLION
	TOTAL $83.3 MILLION

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